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SECTION 16912
SUBMERSIBLE PUMP STATION CONTROL PANELS

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PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

A. GENERAL:

1. The control panels shall be provided by the pump suppliers. They shall be standard panels with special features as described in the contract documents for this particular project and it shall be compatible with the current standards for the City of Savannah. The control panels shall be installed under this division of the specifications.

2. This section of the specification is supplementary to Section 11100 – Submersible Wastewater Pumps. Requirements shown in this section may be more stringent than other requirements in which case the requirements of this section shall govern.

B. QUALITY ASSURANCE:

1. All control system components shall be new and they shall be of a standard product line.

2. All equipment, materials and work on these panels shall be in compliance with all state, local and federal guidelines, and shall conform to the standards by the NEC NFPA No. 70, NEMA, and IEEE. All components shall be listed and labeled by Underwriters laboratories where applicable.

3. The complete assembly shall be tested for proper operation using the sequence described herein, prior to leaving the factory.

4. The manufacturer shall provide a technician to conduct start-up and testing services. This shall include a minimum of six hours working at the project site and all related expenses, tools and parts.

C. PUMP STATION CONTROL PANELS:

1. GENERAL: The following product information relates to the various control system components, and is general in nature. Should a component be shown on the plans and not described herein, such deletion shall not relieve the

Contractor of providing such components to the Engineer's approval with no increase in contract amount.

2. The motor starters and wiring have been only generally detailed, and it shall be the Contractor's responsibility to verify that the components proposed by his suppliers are compatible with the equipment to be controlled. Compliance with accepted standards and codes shall govern component sizing.

1.02 CONTROLS FOR ACROSS THE LINE STARTER:

A. The control panel shall consist of a motor circuit protector, and magnetic starter for each pump motor, and 20 ampere, 1 pole, 120 volt circuit breakers as required or indicated. All pump control operations shall be accomplished by a Milltronics Hydroranger Ultrasonic level control system with all control components mounted in one common enclosure. Control switches shall provide means to operate each pump manually or automatically. When operated in the automatic mode, the control assembly shall provide means to manually select or automatically alternate the position of the "lead" and "lag" pumps after each pumping cycle.

B. Liquid level sensor shall be of the non-contacting, ultrasonic type designed specifically for use in the corrosive environment of a wastewater system and shall be Milltronics Hydroranger. All elements of the instrument, except the transducer, shall be contained in NEMA 4X enclosure. The instrument shall have a LCD display for viewing applicable readings in standard US customary units. The enclosure shall not be required to be opened after initial calibration for the purpose of changing operation or display parameters. The pump controller shall provide for two pumps alternating and a high level alarm. The transducer shall be sealed and encapsulated for operation in the environment of a wet well. The transducer shall have a quick acting internal thermal sensor the temperature correction and shall have a minimum operation range of -20 to 150 degrees Fahrenheit. Measurement range of transducer and monitor shall be 1-50 feet with a blanking zone of twelve (12) inches. Transducer shall differentiate between target echo and other noises caused by water surface turbulence, electrical noise, and pump noise to give reliable and accurate readings. Installation shall be by manufacturers instructions. Level monitor shall be Hydroranger, as manufactured by Milltronics.

C. Additionally there shall be one liquid level sensor provided for back-up high level alarm. The liquid level sensor shall be provided where indicated and shall consist essentially of mechanical switches encapsulated in corrosion-resistant casings. The switch cables shall enter the casing through a watertight compression type fitting suitable for use in corrosive environments. The casing shall contain an eccentric weight which is positioned to insure that the switch tilts in the proper direction. The entire float switch assembly shall be designed for use in raw sewage.

D. The pump controller shall be mounted on the internal hinged door of the electrical control panel for the pump station and wired in accordance with the manufacturer's installation and operating instructions, provided that internal temperature of control panel does not exceed 124 degrees F.

1.03 CONTROLS FOR REDUCED VOLTAGE SOFT STARTERS:

A. The control panel shall consist of a motor circuit protector, and reduced voltage soft starter (RVSS) for each pump motor, and 20 ampere, 1 pole, 120 volt circuit breakers as required or indicated. All pump control operations shall be accomplished by a Milltronics Hydroranger Ultrasonic level control system with all control components mounted in one common enclosure. Control switches shall provide means to operate each pump manually or automatically. When operated in the automatic mode, the control assembly shall provide means to manually select or automatically alternate the position of the "lead" and "lag" pumps after each pumping cycle.

B. Liquid level sensor shall be of the non-contacting, ultrasonic type designed specifically for use in the corrosive environment of a wastewater system and shall be Milltronics Hydroranger. All elements of the instrument, except the transducer, shall be contained in NEMA 4X enclosure. The instrument shall have a LCD display for viewing applicable readings in standard US customary units. The enclosure shall not be required to be opened after initial calibration for the purpose of changing operation or display parameters. The pump controller shall provide for two pumps alternating and a high level alarm. The transducer shall be sealed and encapsulated for operation in the environment of a wetwell. The transducer shall have a quick acting internal thermal sensor the temperature correction and shall have a minimum operation range of -20 to 150 degrees Fahrenheit. Measurement range of transducer and monitor shall be1-50 feet with a blanking zone of twelve (12) inches. Transducer shall differentiate between target echo and other noises caused by water surface turbulence, electrical noise, and pump noise to give reliable and accurate readings. Installation shall be by manufacturers instructions. Level monitor shall be Hydroranger, as manufactured by Milltronics.

C. Additionally there shall be one liquid level sensor provided for back-up high level alarm. The liquid level sensor shall be provided where indicated and shall consist essentially of mechanical switches encapsulated in corrosion-resistant casings. The switch cables shall enter the casing through a watertight compression type fitting suitable for use in corrosive environments. The casing shall contain an eccentric weight which is positioned to insure that the switch tilts in the proper direction. The entire float switch assembly shall be designed for use in raw sewage.

D. The pump controller shall be mounted on the internal hinged door of the electrical control panel for the pump station and wired in accordance with the manufacturer's installation and operating instructions, provided that internal temperature of control panel does not exceed 124 degrees F.

1.04 CONTROLS FOR VARIABLE FREQUENCY DRIVES:

A. The control panel shall consist of a motor circuit protector, a VFD for each pump motor, and 20 ampere, 1 pole, 120 volt circuit breakers as required or indicated. All pump control operations shall be accomplished by a Milltronics Hydroranger Ultrasonic level control system with all control components mounted in one common enclosure. Control switches shall provide means to operate each pump manually or automatically. When operated in the automatic mode, the control assembly shall provide means to manually select or automatically alternate the position of the "lead" and "lag" pumps after each pumping cycle.

B. Liquid level sensor shall be of the non-contacting, ultrasonic type designed specifically for use in the corrosive environment of a wastewater system and shall be Milltronics Hydroranger. All elements of the instrument, except the transducer, shall be contained in a NEMA 4X enclosure. The instrument shall have a LCD display for viewing applicable readings in standard US customary units. The enclosure shall not be required to be opened after initial calibration for the purpose of changing operation or display parameters. The pump controller shall provide for two pumps alternating and a high level alarm. The transducer shall be sealed and encapsulated for operation in the environment of a wetwell. The transducer shall have a quick acting internal thermal sensor for temperature correction and shall have a minimum operating range of -20 to 150 degrees Fahrenheit. Measurement range of transducer and monitor shall be 1-50 feet with a blanking zone of twelve (12) inches. Transducer shall differentiate between target echo and other noises caused by water surface turbulence electrical noise, and pump noise to give reliable and accurate readings. Installation shall be by manufacturers instructions. Level monitor shall be Hydroranger, as manufactured by Milltronics.

C. Additionally there shall be one liquid level sensor provided for back-up high level alarm. The liquid level sensor shall be provided where indicated and shall consist essentially of mechanical switches encapsulated in corrosion-resistant casings. The switch cables shall enter the casing through a watertight compression type fitting suitable for use in corrosive environments. The casing shall contain an eccentric weight which is positioned to insure that the switch tilts in the proper direction. The entire float switch assembly shall be designed for use in raw sewage.

D. The multi-pump controller shall be programmed to operate two variable speed pumps. The controller shall operate the pumps such as to maintain the level in the wetwell. The sequence of operation shall be as follows:

1. With one pump running the speed will be varied to maintain the level.

2. If the level rises the next pump will come on.

3. As the level is reduced and the pumps reduce speed the last started pump will be shut down at a level approximately 10% below the level that it started.

4. The remaining pump will continue to maintain the set level while varying the speed. If the level continues to fall and the speed of the remaining pump drops to a point that it is no longer pumping then it shall be shut down.

5. On a rising level the next pump, in the two pump sequence, becomes the lead pump and is started and the running sequence will be repeated with the second pump.

6. If there is never a shut down of both pumps due to low level then the controller will force the lead pump to change and the sequence to continue as if a shut down for low level had occurred. The sequence will change on a 24-hour basis.

7. The float in the wet well shall be used for a high, high level alarm.

E. Provide integral and redundant cooling with the Equalization Station control cabinet to maintain the required operating conditions for the variable speed drives. Provide an over temperature device within the panel to indicate a high temperature which will be reported to the plant SCADA computer. Also provide a selector switch to manually select either of the two redundant cooling systems.

1.05 STATUS REPORTING:

A. Status and alarm conditions shall be reported to the SCADA System by the controllers for these stations as specified in Contract specifications and shown on the Control Drawings.

1.06 CONSTRUCTION:

A. Where installed outdoors, the electrical control equipment shall be mounted within a NEMA Type 4X dead front enclosure, constructed of not less than 14 gauge Type 304 stainless steel. The enclosure shall be equipped with an inner door and shall incorporate a removable back panel on which control components shall be mounted. Back panel shall be secured to enclosure with collar studs. Enclosure shall be equipped with a stainless steel drip lip. The enclosure shall be equipped with a single handle actuated three point latch closing mechanism and continuous hinge.

B. Where installed indoors, the enclosure shall be NEMA 12, gasketed type.

1.07 COMPONENTS:

A. All motor branch circuit breakers and motor starters shall be of highest industrial

quality, and securely fastened to the removable back panels with screws and washers. Back panels shall be tapped to accept all mounting screws. Self-tapping screws shall not be used to mount any component.

B. Controls with across the line starters shall be provided with open frame, NEMA rated motor starter as manufactured by Square D, for each pump motor. All motor starters shall be equipped to provide overload protection on all phases. Motor starter contacts shall be easily replaceable without removing the motor starter from its mounted position.

C. Controls provided for variable frequency drives shall be as specified in Section 16482 – Variable Frequency Drive Controllers.

D. Controls provided for soft starters shall be Altistart 48 as manufactured by Square D.

1.08 OPERATING CONTROLS AND INSTRUMENTS:

A. All operating controls and instruments shall be securely mounted on the control compartment door. All controls and instruments shall be clearly labeled to indicate function.

B. A six digit, non reset elapsed time meter shall be connected to each motor starter to indicate the total running time of each pump in hours and tenths of hours.

C. Phase monitors shall 480 volt, 3 phase with a surface mounted unit by Diversified Electronics.

D. Control terminal blocks shall be of the screw clamp type, rated 600 volts.

E. Control wire shall be minimum 18 AWG, U.L. #1015. All control wire shall be routed through plastic wire way with snap on covers and be neatly bundled and tie wrapped to from a neat assembly. All control wires will be numbered and will correspond to the supplied electrical schematic.

F. Engraved nameplates shall be supplied for marking all components. The labels shall be attached with a 5 mil thick, 3 M type adhesive. No foam tape will be acceptable. The labels shall be uniform in size with 1/4" minimum letter size.

G. Each control panel shall be equipped with a high level alarm system consisting of a weather proof red lexan light and alarm bell. Upon high level activation, the light will flash and the bell will sound. The bell will remain on until the high level condition clears or until the alarm silence button is pushed. The light will remain on until the high level condition clears.

1.09 POWER SYSTEM COMPONENTS:

A. Wiring: Wiring shall be as shown on plans, or a minimum, as dictated by applicable codes (NEC, etc.). Wiring shall be suitable for the ultimate pump size. All wire shall be THWN and rated for 600 volts, unless noted otherwise.

1.10 PROCEDURES:

A. The basic control system function, indicators, components, and alarms shall be denoted herein for pump station. The Contractor shall be solely responsible for providing control system designs which meet these functional requirements, and approval of shop drawings will not relieve the Contractor of such responsibilities. The complete facilities shall be in accordance with all provisions of the Contract Documents and drawings. The Contractor's attention is directed towards the General Electrical specification for such information. All wiring in control panels shall be orderly with wire ways provided, as necessary. Auxiliary circuit connections shall be made on terminal strips, and wiring shall be identified at each termination.

1.11 COMPONENT SIZING:

A. The contract documents have in some instances detailed certain component sizes and these shall be established as a minimum standard for the component. Should equipment be proposed which requires larger wire or component sizing, such changes shall be made with no increase in contract price.

END OF SECTION 16912